Supplementary Materials

Improvement of Methane Combustion Activity for Pd/ZrO_2 Catalyst by Simple Reduction/Reoxidation Treatment

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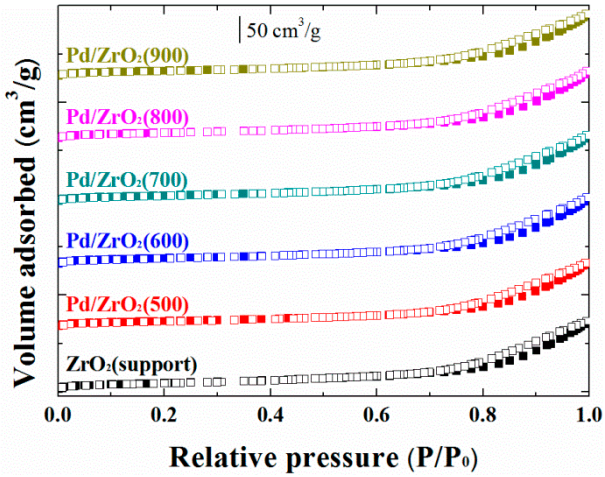

Figure S1. N_2-sorption isotherms of ZrO_2 support and Pd/ZrO_2(x) catalysts. X in parenthesis means calcination temperature in Celsius degree.

Table S1. The quantitative results obtained from cyclic temperature-programmed reactions over Pd/ZrO_2(700) catalyst

Number of cycles	T_5 (°C)	T_{50} (°C)	T_{80} (°C)
1st	388	436	457
2nd	364	423	448
3rd	364	423	446

* T_5, T_{50}, and T_{80} were calculated from the heating cycles.

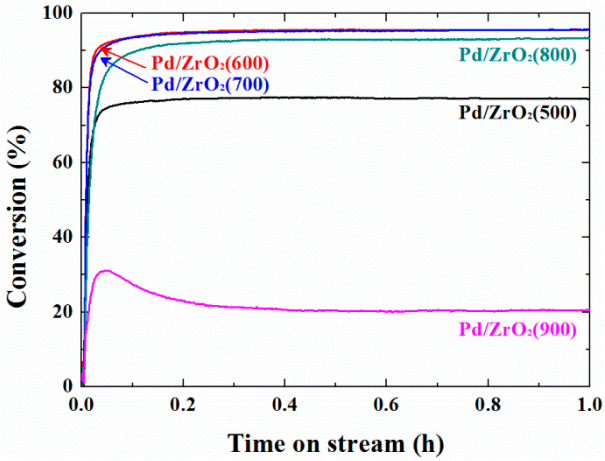

Figure S2. Methane conversion of $Pd/ZrO_2(x)$ catalysts during activation period at 500 °C for 1 h.

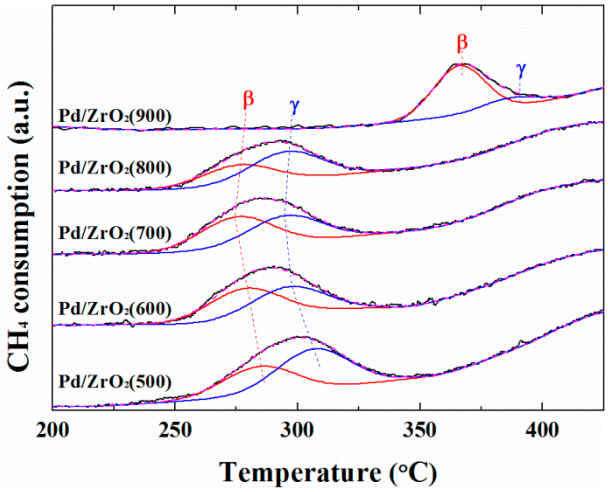

Figure S3. CH_4-TPR profiles of activated $Pd/ZrO_2(x)$ catalysts being deconvoluted into two different reduction peaks.

Table S2. Quantitative results calculated from CH_4-TPR profiles of $Pd/ZrO_2(x)$ catalysts in Figure S3.

Sample	Peak position (°C) (Relative portion, %)	
	β	γ
$Pd/ZrO_2(500)$	284.5 (41.3)	306.6 (58.7)
$Pd/ZrO_2(600)$	278.7 (52.6)	296.5 (47.4)
$Pd/ZrO_2(700)$	275.4 (53.0)	295.2 (47.0)
$Pd/ZrO_2(800)$	276.1 (41.0)	295.4 (59.0)
$Pd/ZrO_2(900)$	356.6 (34.2)	369.9 (65.8)

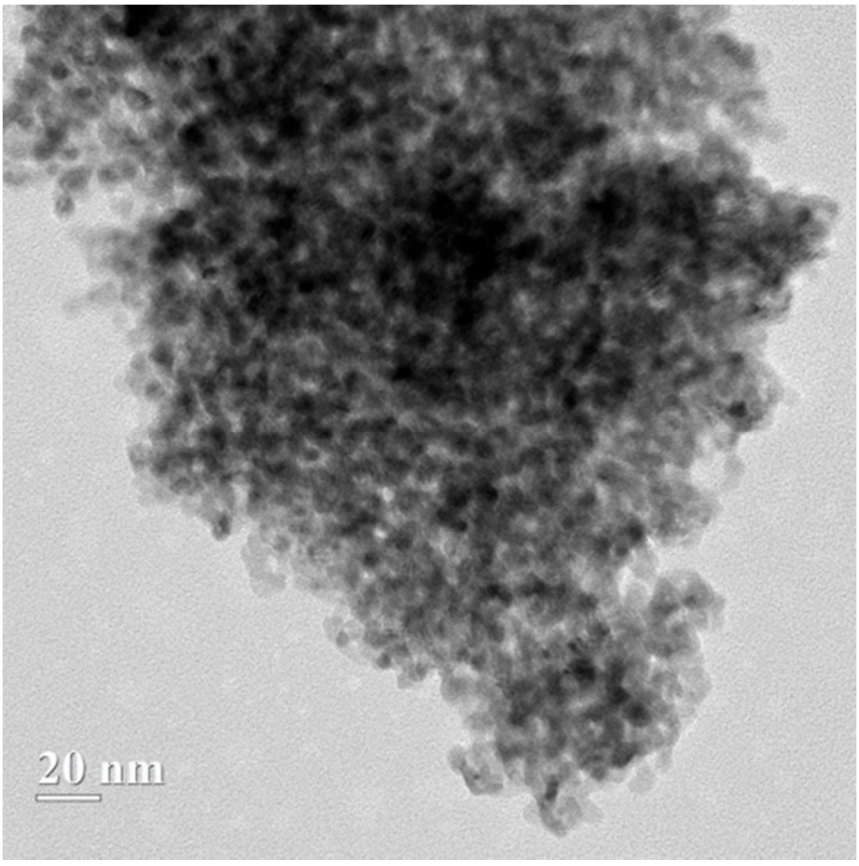

Figure S4. TEM image of the Pd/ZrO_2 (700) catalyst.